

Distribution of the rock-dwelling dasyurids *Pseudantechinus bilarni* and *P. ningbing* in the Northern Territory

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Abstract

Recent and previously unpublished records are reported for two poorly known rock-dwelling dasyurids, *Pseudantechinus bilarni* and *P. ningbing*, which extend their known distribution. The Northern Territory-endemic *P. bilarni* occurs in rocky ranges from the Tabletop Range in the north-west to Wollagorang Station adjacent to the Queensland border, and has also been recorded from central Arnhem Land and Marchinbar Island in north-eastern Arnhem Land. The distribution of *P. ningbing* extends from the Kimberley region to the northern side of the Victoria River. The distribution of the two *Pseudantechinus* species is strongly associated with the most rugged topography in the northern Northern Territory. The extent to which *P. bilarni* is geographically disjunct from *P. ningbing* has not been established, but they may be separated by the lowlands of the Daly River in north-western Northern Territory. The distribution of *P. bilarni* overlaps that of *Pseudantechinus mimulus* in the Gulf region, although the status of the latter taxon on the mainland is unclear. While *P. bilarni* and *P. ningbing* are closely associated with extremely rocky habitats, they occur across a broad range of vegetation types. Although patchily distributed, these species are probably locally common and both occur within conservation reserves.

Introduction

Four species of *Pseudantechinus* (small carnivorous marsupials of the family Dasyuridae) are found in the Northern Territory. Three (*P. bilarni*, *P. mimulus* and *P. ningbing*) are associated with rocky slopes and hills in the northern half of the Northern Territory, the fourth (*P. macdonnellensis*) is widely distributed in Central Australia.

The Sandstone Antechinus *Pseudantechinus bilarni* was described in 1954 from specimens collected on the western Arnhem Land massif (Johnson 1954, 1964).

Subsequent field studies have examined its reproduction (Begg 1981, Calaby & Taylor 1981) and habitat distribution (Begg 1981), but there has been little attempt to consider its range and conservation status. This species was widely held to be restricted to a relatively small area of the western Arnhem Land escarpment, from around Oenpelli and Mt Borradaile in the north to around El Sherana within Stage III of Kakadu National Park to the south (Parker 1973, Begg 1981, 1988, Woinarski *et al.* 1992), although the map of Woolley and Begg (1995) showed it as also occurring in the Gulf region of the Northern Territory.

Pseudantechinus ningbing was first collected in the north-eastern Kimberley in 1965. It was not formally described until 1988 (Kitchener 1988), although it had previously been recognised as a distinct species (Baverstock *et al.* 1982, Archer 1982, Woolley 1982, Cooper & Woolley 1983). Other than observations on reproduction in wild-caught and captive animals (Woolley 1988) little is known of its biology. It is widely distributed within the Kimberley region, extending to the Northern Territory border in the east (Kitchener 1988).

Here we collate information from museum specimens, Parks and Wildlife Commission (PWCNT) files and reports, personal observations and communications from colleagues, and recent fauna surveys within the Northern Territory (Menkhorst & Woinarski 1992, Woinarski & Fisher 1995, Churchill 1996, Trainor 1996, Churchill 1997, Griffiths *et al.* 1997a, 1997b) which extends the recognised range of *P. bilarni* and *P. ningbing*. The separation of *Pseudantechinus* species is not straightforward without detailed skull measurements (Kitchener 1988, Kitchener & Caputi 1988, Kitchener 1991), so identification here of some field records that are unsupported by museum specimens is tentative but parsimonious. The identity of the most distant records of *P. bilarni* here reported (Wessel Islands & Wollogorang Sn) was confirmed after detailed investigation of specimens by NC. The distribution of the records is mapped in Fig. 1 and details of locations and museum specimens given in Table 1.

Pseudantechinus bilarni

Wessel Islands

Recorded by AF, CP and JW from two animals trapped on north Marchinbar Island (site 1a in Fig. 1) on 19 July 1993 and 16 September 1994, in sandstone rock piles adjacent to the beach (with some rocks below the high water mark). Both were caught in Elliott traps placed around the rock piles after seeing the animals when spotlighting. No *Pseudantechinus* were caught in nearly 12,000 trapnights of systematic trapping across all other main habitats on Marchinbar Island. However, hairs identified as *Pseudantechinus* sp. (by B. Triggs *pers. comm.*) were recorded from dingo seats collected at another site on Marchinbar Island (site 1b) on 5 October 1994.

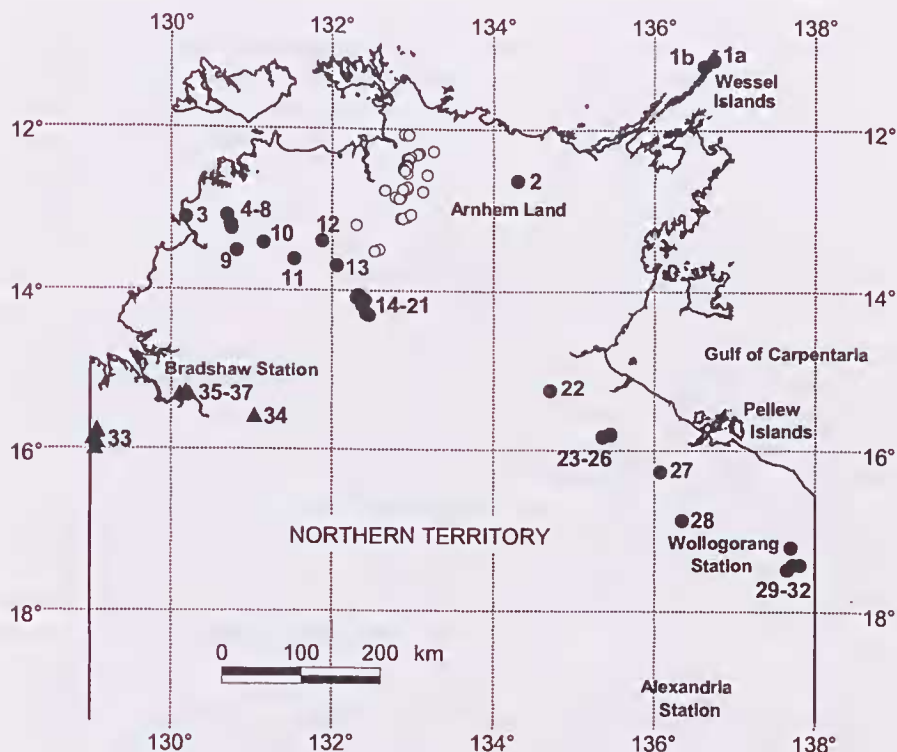


Figure 1. Records of *Pseudantechinus bilarni* (closed circles) and *P. ningbing* (triangles), with site numbers referred to in the text. Open circles mark records of *P. bilarni* from the western Arnhem escarpment (PWCNT Fauna Database).

Arnhem Land

Two individuals were captured by AF on the upper Cadell River in central Arnhem Land (site 2) in September 1997. The site was on the edge of a large sandstone tower outcropping from sandy soil bordering the river and had an open woodland of *Eucalyptus arnhemensis*, *E. arafurensis* and *Acacia plectocarpa*, with a sparse tussock grass ground layer.

Litchfield-Katherine region

The most north-westerly record of *P. bilarni* is a specimen collected for H.H. Finlayson by E.R. Petherick in 1957 from Tabletop Range (site 3), near what is now Litchfield National Park. AF and AG captured one individual at Tjaynera (Sandy Creek) Falls

(site 4) within Litchfield Park in December 1990 (Bell & Whelan 1993). The capture site was a steep rocky (sandstone) slope with a low open woodland of *Eucalyptus*, *Terminalia* and *Gardenia* spp., and a sparse hummock grass understorey. Subsequently, during a biological survey of Litchfield National Park between October 1995 and May 1996 (Griffiths *et al.* 1997b) a total of eight *P. bilarni* were captured from five locations (sites 5-9). All sites were very rocky, massive sandstone outcrops or steep stony slopes on the dissected margins of the Tabletop Range. However, vegetation varied substantially, including open forest of *Eucalyptus miniata* and *E. tetradonta*, mixed open woodland (*Xanthostemon paradoxus*, *Eucalyptus* spp., *Livistona humilis*) and shrubby heath (*Jacksonia dilatata*, *Calytrix exstipulata*).

There are a scatter of records between Litchfield and Nitmiluk National Parks. One individual was captured north of Pine Creek (site 12) in June 1988 by S. Kerin (PWCNT), from a steep hillslope with large granite boulders. The animal was retained alive for some time at the Territory Wildlife Park. A single individual was caught by SC on Mary River Station (site 13) on 7 March 1990. A further two animals were caught by SC at Robin Falls (site 10) on 27 April 1990, at a small outcrop of sandstone cliff and boulder piles. G. Williams (Northern Territory University) captured one animal at Depot Creek (site 11) on 17 June 1995, from a small sandstone escarpment with an overstorey of *Eucalyptus phoenicea*/*E. miniata*/*E. tetradonta*, an *Acacia* shrub layer and a dense *Sorghum* understorey. The animal was identified by JW from a photograph.

E.R. Petherick also collected a specimen of *P. bilarni* from "granite formation" at "Head Fergusson River" (site 14) in 1956. In surveys from June 1981 to October 1982, at least 19 individuals were caught at seven locations in Katherine Gorge (Nitmiluk) National Park (sites 15-21) (R. Begg, unpublished notes held in PWCNT files). Habitat notes accompanying the specimens refer to 'rock outcrops' and 'closed forest gorge'.

Gulf region

The first record of *P. bilarni* from this region is a specimen collected by J. McKean near Old St Vidgeon homestead (site 22) in 1982, which was trapped on a "sandstone scree slope covered with spinifex" (King and McKean 1982).

The most south-easterly records of the species are from Wollogorang Station, adjacent to the Queensland border. Two animals were trapped by N. Gambold and K. Menkhurst on 6 June 1990 in a monsoon vine thicket on sandstone boulders of an escarpment at McDermott's Creek spring (site 29). Eight individuals were also trapped on Wollogorang Station by CT and SC between April 1993 and September 1995 (from a total of c. 30,000 trapnights). These included one additional record from

McDermott's Creek spring, three from Moonlight Gorge (site 30), three from Banyan Gorge (site 31) and one from Aquarium Springs (site 32). All capture sites were on steep sandstone scree slopes with patches of dry monsoon vine thicket plants (containing species such as *Antidesma parvifolium*, *Celtis philippensis*, *Cissus reniformis*, *Croton habrophyllus*, *Diospyros humilis* and *Pouteria sericea*) or a woodland of *Eucalyptus dichromophloia* and broadleaf species (such as *Buchanania obovata*, *Gardenia* spp. and *Terminalia* spp.) with an understorey of *Plectrachne pungens*.

There have subsequently been a few records of *P. bilarni* from the Gulf region, scattered through the area between St Vidgeon and Wollagorang Stations. One individual was captured at Caranbirini Waterhole (site 27) by J. Barnett (M. Fleming pers. comm., Anon. 1991), although details of precise location, date and habitat are not available. During biological surveys of the proposed Limmen Gate National Park in September 1995 and May 1996 (Griffiths *et al.* 1997a) a total of five individuals were trapped at four locations (sites 23-26). All sites were associated with highly dissected sandstone towers or rugged sandstone ridges of the Abner formation, with a sparse open woodland (*Eucalyptus papuana*, *E. miniata*, *E. phoenicea*, *Owenia vernicosa*) or shrubby overstorey (*Acacia oincocarpa*, *A. difficilis*, *Jacksonia odontoclada*, *Grevillea heliosperma*) and a tussock grass (*Triodia microstachya*) understorey. In November 1996, P. Barden (pers. comm.) collected a number of small scats in the Glyde River area (site 28) which contained groomed hairs attributable to *Pseudantechinus*. The scats were found on a ledge bordering a small drainage line through outcropping sandstone. Vegetation in the area was a low open woodland of *Eucalyptus dichromophloia* and *E. herbertiana* with a sparse shrub layer (*Acacia* spp., *Calytrix exstipulata*, *Jacksonia odontoclada*, *Grevillea heliosperma*) and a ground layer of *Plectrachne pungens*.

Pseudantechinus ningbing

The first collection of *P. ningbing* in the Northern Territory that we can locate was by A. Spring from Keep River National Park (site 33) on 6 August 1981. A further five specimens were collected from the Park between August 1981 and April 1982 by Spring, R. Pengilley, G. van Cleave and K. Martin, and the species was also recorded there by J. Barnett in September 1991. Habitat notes associated with the specimens refer to 'rock outcrops', 'hummock grassland' and 'shrubland'. The general area of these records is a rugged dissected rock plateau of sandstone and conglomerate, with an open woodland of *Eucalyptus* spp. and *Livistona* sp. or a sparse shrubland of *Acacia* spp., *Grevillea refracta* and *Calytrix exstipulata* (Sivertsen & Van-Cuylenburg 1986).

Two individuals were captured by F. Kristo adjacent to the Victoria River (site 34) on 29 May 1986, during an Operation Raleigh survey of the proposed Gregory National Park. One animal came from a sandstone plateau and the other from the base of a

tall sandstone cliff with sparse vegetation dominated by *Livistona* sp.

AF and JW captured three *P. ningbing* at Bradshaw Station (site 34) in June 1997, on a low sandstone cliff with ledges, clefts and rock slabs. The cliff had scattered trees of *Eucalyptus brachyandra*, *Xanthostemon paradoxus*, *Ficus* spp. and *Terminalia* spp. and was adjacent to a permanent creek. Another individual was seen by PWCNT rangers while spotlighting in a large rocky gully in a dissected sandstone range (site 35), which had a mixed sparse woodland (*Xanthostemon paradoxus*, *Terminalia carpentariae*, *Callitris intratropica*, *Acacia* spp.) and a sparse *Triodia* sp. understorey. One *P. ningbing* was also captured by staff of ERA Environmental Services (L. Corbett, pers. comm.) on Bradshaw Station (site 36) in June 1997, on a steep rock scree in a sandstone gorge with scattered *Eucalyptus* spp.

Discussion

The records described here extend the distributions of these two relatively poorly-known species and provide some information on habitat, but also pose some interesting biogeographic questions relating to the patchy distribution of *P. bilarni*, and the extent to which the four species of *Pseudantechinus* that occur in the Northern Territory are geographically disjunct.

In addition to its well-established distribution along the western Arnhem Land escarpment, *P. bilarni* has now been recorded from rocky range country extending from the Tabletop Range in the north-west of the Northern Territory to Wologorang Station in the south-east, close to the Queensland border. The distribution of the species corresponds strongly to the distribution of the most rugged topography in the northern Northern Territory (Fig. 2), likely to contain large areas of very rocky habitat. In common with many other saxicoline species, the occurrence of *P. bilarni* within this extensive area is probably patchy, in accord with the discontinuities between the main sandstone ranges (Ford 1978).

The locality on the Cadell River is on the eastern edge of the rugged sandstone plateau of western Arnhem Land and *P. bilarni* is likely to occur elsewhere between this site and the western Arnhem escarpment. The occurrence of the species on Marchinbar Island in north-eastern Arnhem Land appears to represent a significant disjunction although, apart from the north-eastern margin, there has been minimal systematic fauna survey effort in eastern Arnhem Land. While Marchinbar Island may have been continuous with the mainland during past periods of lower sea levels, it is also separated from the mainland rocky ranges by an extensive area of lateritic surface of subdued relief. The current absence of records of *Pseudantechinus* from Groote Eylandt is also surprising given appreciable wildlife survey effort, although this has been concentrated on the lowlands rather than in the less accessible sandstone uplands (Webb 1992).

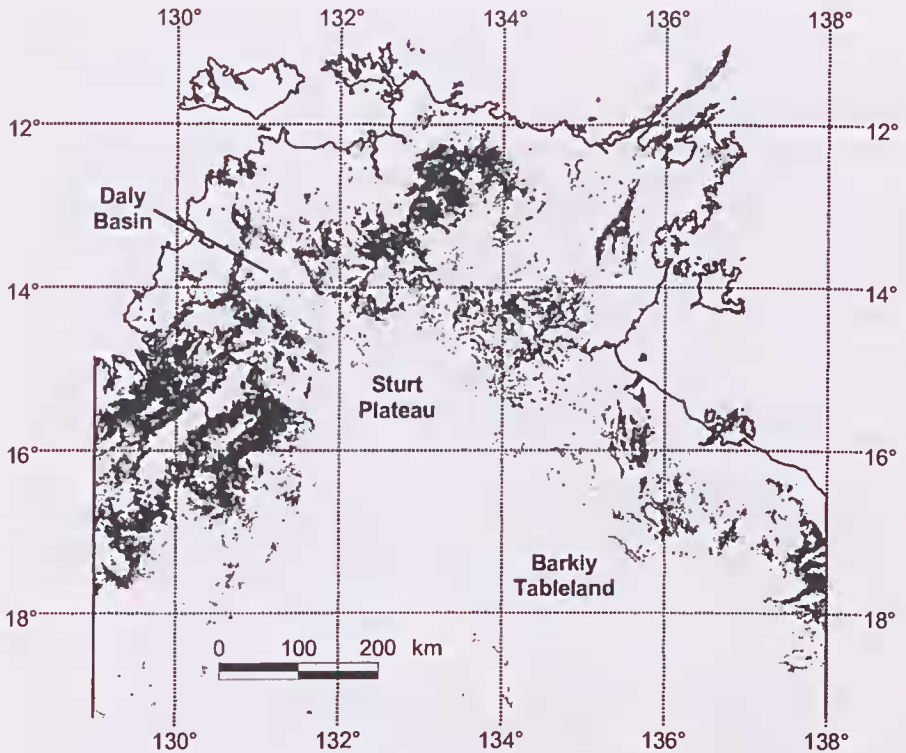


Figure 2. Distribution of rugged terrain in the northern Northern Territory (dark shading). Derived by calculating elevation range within a moving window passing across a Digital Elevation Model.

Pseudantechinus bilarni closely approaches the range of, and is possibly sympatric with, *P. mimulus* in the Gulf region. *Pseudantechinus mimulus* was originally described from a single specimen collected in 1905 from 'Alexandria' in the Gulf hinterland (Thomas 1906). The species was redescribed following the collection of specimens in 1967 from North Island in the Sir Edward Pellew group (Kitchener 1991) and it was subsequently also recorded from Centre and South-West Islands (Johnson & Kerle 1991). The only collection attributable to this species from the mainland since the type collection is a single specimen at MAGNT from Tanumbirini Station (U1212: 16°28'S 134°32'E) which is of doubtful provenance. While the current location of Alexandria Station (19°03'S 136°42'E) is considerably inland of the distribution described here for *P. bilarni*, and largely encompasses tussock grassland on blacksoil plain, the area referred

to as Alexandria has been considerably larger historically and the precise location of the holotype for *P. mimulus* remains in question. The status of *P. mimulus* on the mainland and the distributional limits of this species and *P. bilarni* in areas of possible overlap requires further wildlife survey work to resolve.

While the distribution of the central Australian *P. macdonnellensis* approaches that of other *Pseudantechinus* species in Western Australia (Kitchener & Caputi 1988), it appears to be geographically isolated from *P. bilarni*, *P. ningbing* and *P. mimulus* in the Northern Territory. Most Northern Territory records for *P. macdonnellensis* lie south of 20°S, the most northerly records being in the vicinity of Helen Springs (18°43'S 133°87'E). This locality is separated from the rocky ranges of the Gulf and Top End by the flat plains of the Barkly Tableland and Sturt Plateau (Fig 2). However, a recent record of *P. macdonnellensis* from Mt Isa in north-western Queensland (Griffiths, unpubl. data) is not geomorphologically disjunct from the easterly known limit for *P. bilarni*.

The records for *P. ningbing* reported here extend its known distribution north-easterward from the Kimberley region to the northern side of the Victoria River. The occurrence of *P. ningbing* at Bradshaw Station was mirrored by that of a number of other vertebrate species with a predominantly Kimberley distribution (e.g. White-quilled Rock Pigeon *Petrophassa albipennis*, *Ctenotus tantillus*, *Heteronotia planiceps*). A series of rugged sandstone ranges occur to the north of Bradshaw Station, through the Fitzmaurice and Daly regions to the Litchfield area from which *P. bilarni* is reported. Surveys in this area may indicate more precisely the limits of distribution of the two *Pseudantechinus* spp. Ford (1978) identified the lowlands along the Daly River as one barrier possibly resulting in the vicariance of rock-inhabiting bird species in the Kimberley and Northern Territory.

There is little similarity in vegetation for the records of *P. bilarni* that we report here, varying from bare rock to open hummock grassland to closed thickets. This lack of association with vegetation structure or floristics has been reported previously by Calaby (1973) and Kerle & Burgman (1984). In contrast, extensive cover of scree, boulders and/or rock slabs with crevices (mostly of sandstone, but occasionally of granite) is common to all sites. The association with this habitat feature was noted previously by Begg (1981), who considered that there may also be some seasonal change in preference for vegetation type within the sandstone mosaic. *Pseudantechinus ningbing* is similarly associated with very rocky habitats, including both sandstone outcrops and limestone ridges (Kitchener 1988). Our observations along with habitat descriptions for Kimberley records (McKenzie *et al.* 1975, Kitchener *et al.* 1981, Woinarski 1992) suggest that this species occurs in a comparable variety of vegetation types to *P. bilarni*.

The survey techniques from which most of these records arise are not well suited for

deriving accurate assessments of the local abundance of individual species. During repeated trapping of two sites at Wollongorang Station over a period of 16 months (c. 17500 trapnights), a total of only three individuals of *P. bilarni* were captured (Trainor 1996). However, the number of individuals captured or observed within short periods at other sites suggests they may become locally common. It is also interesting to note that some intensive fauna surveys in rugged rocky habitats and in the vicinity of the records reported here, have not captured any *Pseudantechinus*. This is particularly marked in the Gulf Region where, for example, *P. bilarni* were recorded at only four of 21 sites containing apparently suitable habitat (Churchill 1996, Trainor 1996). This may reflect a very patchy distribution, large seasonal or between-years variation in abundance, and/or a reluctance of these species to enter standard live animal traps.

Despite their patchy distribution, both species are well represented in the Northern Territory reserve system, reflecting the bias in reservation towards rugged sandstone environments. *Pseudantechinus bilarni* occurs in Kakadu and Litchfield National Parks in the northern Top End, and in the proposed Linnen Gate National Park in the Gulf region. The majority of Northern Territory records for *P. ningbing* are from Keep River National Park, and this species may also occur more extensively in Gregory National Park than the single record suggests.

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Table 1. Details of *Pseudantechinus* records. Site numbers refers to Fig. 1 and descriptions in the text. Specimen numbers refer to the collection of the Museum and Art Galleries of the Northern Territory except those indicated from the Western Australian Museum (WAM). Initials refer to the authors of this article.

Site	Latitude	Longitude	Observer / collector / reference	Specimen(s)
1a	11° 02' S	136° 44' E	AF (Woinarski & Fisher 1996)	U4100
1b	11° 13' S	136° 37' E	hairs in scat (Woinarski & Fisher 1996)	-
2	12° 39' S	134° 18' E	AF	-
3	14° 04' S	132° 19' E	E Petherick	U3152
4	13° 15' S	130° 45' E	AF & AG (Bell & Whelan 1993)	-
5	13° 13' S	130° 44' E	P Homer (Griffiths et al. 1997b)	U4310
6	13° 13' S	130° 45' E	P Homer (Griffiths et al. 1997b)	U4311
7	13° 13' S	130° 45' E	AG (Griffiths et al. 1997b)	-
8	13° 06' S	130° 42' E	AG (Griffiths et al. 1997b)	-
9	13° 31' S	130° 49' E	AG (Griffiths et al. 1997b)	-
10	13° 25' S	131° 09' E	SC (Churchill 1997)	-
11	13° 38' S	131° 32' E	G Williams	-
12	13° 24' S	131° 52' E	S Kerin	WAM29515
13	13° 42' S	132° 03' E	SC (Churchill 1997)	-
14	13° 07' S	130° 11' E	E Petherick	U3151
15	14° 08' S	132° 24' E	R Begg	U401, U405
16	14° 19' S	132° 28' E	R Begg T Bartlett CCNT	U407 U408 U463
17	14° 06' S	132° 17' E	P Dahl	U501
18	14° 12' S	132° 22' E	R Begg	U600, U601
19	14° 07' S	132° 23' E	R Begg	-
20	14° 18' S	132° 25' E	R Begg	-
21	14° 18' S	132° 26' E	R Begg	-
22	15° 17' S	134° 42' E	J McKean (King & McKean 1982)	U353
23	15° 50' S	135° 27' E	S Eldridge	U4530
24	15° 49' S	135° 27' E	AG (Griffiths et al. 1997a)	U4340
25	15° 51' S	135° 21' E	AG (Griffiths et al. 1997a)	-
26	15° 51' S	135° 21' E	AG (Griffiths et al. 1997a)	-
27	16° 16' S	136° 05' E	J Barnett	-

Site	Latitude	Longitude	Observer / collector / reference	Specimen(s)
28	16° 52' S	136° 21' E	P Barden	-
29	17° 25' S	137° 48' E	K Menkhorst (Menkhorst & Woinarski 1992)	U0712
30	17° 25' S	137° 43' E	CT/SC (Churchill 1996)	-
30	17° 25' S	137° 43' E	CT/SC (Churchill 1996)	-
31	17° 12' S	137° 42' E	CT (Trainor 1996)	U4131
32	17° 29' S	137° 39' E	CT/SC (Churchill 1996)	-
33	15° 46' S	129° 05' E	A Spring	U403
	15° 55' S	129° 05' E	R Pengilley	U404
	15° 52' S	129° 02' E	G Van Cleave	U4037, U4038
	15° 48' S	129° 05' E	A Spring	U402
	16° 00' S	129° 03' E	K Martin	U350
	15° 53' S	129° 02' E	J Barnett	-
34	15° 36' S	131° 02' E	F Kristo	U436
35	15° 19' S	130° 06' E	AF	U4580
36	15° 19' S	130° 13' E	PWCNT rangers	-
37	15° 18' S	130° 11' E	L Corbett, M Spain & A Hertog	U4578